

Year-to-Year Variations in Monthly Sunshine Totals1. Introduction.

It is required to know the possible variations of monthly sunshine. The simplest method of doing this is the calculation of ten sample percentages, which when multiplied by the average, give a picture of the variation within a decade.

2. Method.

The 50-year records of 6 stations were used, namely, Newton Rigg (Cumberland), Scarborough (Yorks. N.R.), Llandudno (N.Wales), Oxford, Rothamsted (Herts.) and Penzance (Cornwall). For each station and each month, the 50-year average was found:

Average sunshine hours (1901-1950)

Month	Newton Rigg	Scarborough	Llandudno	Oxford	Rothamsted	Penzance
Jan.	39	43	52	54	54	59
Feb.	62	65	71	70	69	79
Mar.	105	109	120	115	118	133
Apr.	143	151	168	153	153	183
May	185	178	207	187	196	211
June	195	189	213	199	205	216
July	164	172	187	184	192	207
Aug.	152	161	172	177	183	200
Sep.	121	136	137	139	144	155
Oct.	86	97	98	101	103	117
Nov.	54	56	58	63	64	76
Dec.	33	35	40	48	45	55
Year	1339	1392	1523	1490	1526	1691 hours

The year-to-year totals were expressed as a percentage of average and arranged in numerical order. The sample percentages for a decade were found from the mean of each successive five percentage values. These samples were then meaned over the six stations.

Results.

Table I gives the results obtained in this manner, together with the mean sample variations for all months of the year. The variation is greatest in winter when averages are small; the least variation is found in late spring and early summer.

Table II shows the behaviour of individual stations, in order of descending variability for the four usual seasons. The coastal stations show the least tendency to vary far from the average; the greatest variation is usually in the north.

Table III shows the mean extremes (in 50 years) and the absolute extremes from the six stations under review. The large variation of extreme sunnyness in August is exceptional and was recorded at Newton Rigg in 1947. The next largest is far below this value (Llandudno 156 per cent). Otherwise the extremes follow an expected pattern.

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TABLE I.

Variation in Monthly Sunshine Totals (1901-50)

(expressed as percentages of average)

S A M P L E S

Month	1	2	3	4	5	6	7	8	9	10
January	58	74 $\frac{1}{2}$	82 $\frac{1}{2}$	88 $\frac{1}{2}$	93	100	109	118	128 $\frac{1}{2}$	148
February	54	72	80 $\frac{1}{2}$	89	95 $\frac{1}{2}$	102 $\frac{1}{2}$	109 $\frac{1}{2}$	118	128 $\frac{1}{2}$	150 $\frac{1}{2}$
March	61 $\frac{1}{2}$	74	82 $\frac{1}{2}$	89	94 $\frac{1}{2}$	100 $\frac{1}{2}$	107	115 $\frac{1}{2}$	125 $\frac{1}{2}$	150
April	64 $\frac{1}{2}$	75 $\frac{1}{2}$	83 $\frac{1}{2}$	89	95	100 $\frac{1}{2}$	106	115	128	143
May	68	80	85	90	95 $\frac{1}{2}$	101	105 $\frac{1}{2}$	115	122	138
June	67 $\frac{1}{2}$	81 $\frac{1}{2}$	87	92	97	103	108	112 $\frac{1}{2}$	119	132 $\frac{1}{2}$
July	62 $\frac{1}{2}$	75	82 $\frac{1}{2}$	89	96 $\frac{1}{2}$	102	108 $\frac{1}{2}$	116	126 $\frac{1}{2}$	141 $\frac{1}{2}$
August	68	79 $\frac{1}{2}$	85	90 $\frac{1}{2}$	96	101 $\frac{1}{2}$	107 $\frac{1}{2}$	113	120 $\frac{1}{2}$	138 $\frac{1}{2}$
September	65	77 $\frac{1}{2}$	83	89	95	101	108	116	124	141 $\frac{1}{2}$
October	69	80	86	92	97	101 $\frac{1}{2}$	106 $\frac{1}{2}$	112 $\frac{1}{2}$	120	135 $\frac{1}{2}$
November	59	74	80 $\frac{1}{2}$	87	93 $\frac{1}{2}$	101 $\frac{1}{2}$	109 $\frac{1}{2}$	117 $\frac{1}{2}$	128 $\frac{1}{2}$	149
December	56	69 $\frac{1}{2}$	77 $\frac{1}{2}$	88	96	102 $\frac{1}{2}$	109	118	129 $\frac{1}{2}$	154
Mean	62 $\frac{1}{2}$	76	83	89 $\frac{1}{2}$	95 $\frac{1}{2}$	101 $\frac{1}{2}$	108	115 $\frac{1}{2}$	125	143 $\frac{1}{2}$

TABLE II
Variations of Sunshine Totals
(w.r.t. season and site)

SAMPLE PERCENTAGES

<u>Spring</u>	1	2	3	4	5	6	7	8	9	10
Oxford	61 $\frac{1}{2}$	72	79 $\frac{1}{2}$	87 $\frac{1}{2}$	95 $\frac{1}{2}$	100 $\frac{1}{2}$	107 $\frac{1}{2}$	118 $\frac{1}{2}$	129 $\frac{1}{2}$	148
Newton Rigg	61 $\frac{1}{2}$	74	84	89	95	100 $\frac{1}{2}$	106	115	127 $\frac{1}{2}$	147 $\frac{1}{2}$
Rothamsted	64 $\frac{1}{2}$	75 $\frac{1}{2}$	80 $\frac{1}{2}$	87	93 $\frac{1}{2}$	101 $\frac{1}{2}$	106 $\frac{1}{2}$	115	127 $\frac{1}{2}$	148 $\frac{1}{2}$
Scarborough	64 $\frac{1}{2}$	77	84 $\frac{1}{2}$	91	95	101	106	116 $\frac{1}{2}$	124	140 $\frac{1}{2}$
Llandudno	66 $\frac{1}{2}$	79 $\frac{1}{2}$	86	91 $\frac{1}{2}$	95 $\frac{1}{2}$	100 $\frac{1}{2}$	105 $\frac{1}{2}$	112 $\frac{1}{2}$	121	141 $\frac{1}{2}$
Penzance	69 $\frac{1}{2}$	81	87 $\frac{1}{2}$	91 $\frac{1}{2}$	95 $\frac{1}{2}$	99 $\frac{1}{2}$	105 $\frac{1}{2}$	113 $\frac{1}{2}$	122	134 $\frac{1}{2}$
<u>Summer</u>										
Newton Rigg	61 $\frac{1}{2}$	77	83 $\frac{1}{2}$	89	95 $\frac{1}{2}$	102 $\frac{1}{2}$	109 $\frac{1}{2}$	115 $\frac{1}{2}$	122 $\frac{1}{2}$	143 $\frac{1}{2}$
Oxford	63 $\frac{1}{2}$	76	82 $\frac{1}{2}$	90	96 $\frac{1}{2}$	102 $\frac{1}{2}$	108	115	126	140
Scarborough	64	78	86	91 $\frac{1}{2}$	97 $\frac{1}{2}$	103	108	113	121	138
Rothamsted	65 $\frac{1}{2}$	78 $\frac{1}{2}$	84	90	97	100 $\frac{1}{2}$	107	114 $\frac{1}{2}$	125 $\frac{1}{2}$	137 $\frac{1}{2}$
Llandudno	70	80	86	91	95 $\frac{1}{2}$	102 $\frac{1}{2}$	107 $\frac{1}{2}$	113 $\frac{1}{2}$	119 $\frac{1}{2}$	134 $\frac{1}{2}$
Penzance	72	81	86 $\frac{1}{2}$	91 $\frac{1}{2}$	98	102 $\frac{1}{2}$	107 $\frac{1}{2}$	112	117 $\frac{1}{2}$	131 $\frac{1}{2}$
<u>Autumn</u>										
Oxford	62 $\frac{1}{2}$	78 $\frac{1}{2}$	84	89 $\frac{1}{2}$	94 $\frac{1}{2}$	100 $\frac{1}{2}$	105 $\frac{1}{2}$	114	124 $\frac{1}{2}$	146 $\frac{1}{2}$
Newton Rigg	63	76	81 $\frac{1}{2}$	87 $\frac{1}{2}$	93 $\frac{1}{2}$	100 $\frac{1}{2}$	109 $\frac{1}{2}$	117 $\frac{1}{2}$	127 $\frac{1}{2}$	143 $\frac{1}{2}$
Rothamsted	64	76	81	88	94 $\frac{1}{2}$	102 $\frac{1}{2}$	107 $\frac{1}{2}$	116 $\frac{1}{2}$	126	144
Scarborough	62	75 $\frac{1}{2}$	82 $\frac{1}{2}$	90 $\frac{1}{2}$	96 $\frac{1}{2}$	102 $\frac{1}{2}$	110	116 $\frac{1}{2}$	123 $\frac{1}{2}$	140 $\frac{1}{2}$
Llandudno	66 $\frac{1}{2}$	77 $\frac{1}{2}$	84 $\frac{1}{2}$	88 $\frac{1}{2}$	95 $\frac{1}{2}$	100	108	114 $\frac{1}{2}$	124	141
Penzance	68 $\frac{1}{2}$	79 $\frac{1}{2}$	85 $\frac{1}{2}$	92 $\frac{1}{2}$	95 $\frac{1}{2}$	101 $\frac{1}{2}$	107 $\frac{1}{2}$	113 $\frac{1}{2}$	120	136
<u>Winter</u>										
Scarborough	45	63	74	84 $\frac{1}{2}$	93 $\frac{1}{2}$	102 $\frac{1}{2}$	113 $\frac{1}{2}$	125	137 $\frac{1}{2}$	161 $\frac{1}{2}$
Newton Rigg	53 $\frac{1}{2}$	69 $\frac{1}{2}$	79 $\frac{1}{2}$	90	96	102	109 $\frac{1}{2}$	117 $\frac{1}{2}$	130 $\frac{1}{2}$	152
Rothamsted	55 $\frac{1}{2}$	71 $\frac{1}{2}$	79 $\frac{1}{2}$	88 $\frac{1}{2}$	94 $\frac{1}{2}$	101 $\frac{1}{2}$	109	119	129	152
Llandudno	60 $\frac{1}{2}$	75 $\frac{1}{2}$	81 $\frac{1}{2}$	88	94 $\frac{1}{2}$	101	108 $\frac{1}{2}$	114 $\frac{1}{2}$	124	152
Oxford	57 $\frac{1}{2}$	75 $\frac{1}{2}$	82	90	96	101 $\frac{1}{2}$	106 $\frac{1}{2}$	118	128 $\frac{1}{2}$	144 $\frac{1}{2}$
Penzance	63	77	85	89	94	102	108	116	123 $\frac{1}{2}$	142 $\frac{1}{2}$

TABLE III.

Extremes of Sunshine Totals (1901-1950)

Month	Sunniest		Cloudiest		} 6 sample stations
	Absolute	Mean	Mean	Absolute	
	<u>Percentages of average</u>				
January	206	164	41	19	
February	197	167	38	22	
March	202	176	51	36	
April	164	153	57	49	
May	158	149	56	37	
June	158	147	60	55	
July	168	155	51	41	
August	201	158	50	36	
September	160	155	56	46	
October	162	148	62	57	
November	178	168	48	38	
December	189	173	47	34	